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TITLE: Thermoplastic polyurethane composition*Ishiguro*Abstract Text (1):

A thermoplastic polyurethane composition comprises a thermoplastic polyurethane and a tin compound. The tin compound is contained in an amount of 0.3 to 15 ppm as converted into tin atom based on the thermoplastic polyurethane. The thermoplastic polyurethane composition has a retention ratio of long-chain hard segments when melt treated at 220.degree. C. for 60 minutes of at least 85%. The thermoplastic polyurethane composition also has a retention ratio of inherent viscosity when melt treated at 220.degree. C. for 6 minutes and then melt extruded and, thereafter, allowed to stand at 20.degree. C., 60% RH (relative humidity) for 24 hours of at least 85%. The thermoplastic polyurethane composition has excellent mold-ability and gives molded products being excellent in tensile strength and elongation, heat resistance, compression set, resistance to hydrolysis and like properties, and are hence useful as a raw material for various items. The thermoplastic polyurethane composition also has excellent spinnability and gives fibers having excellent hot water resistance, resistance to hydrolysis, unwindability and like properties, and are hence also useful as a material for elastic fibers.

Brief Summary Text (3):

The present invention relates to thermoplastic polyurethane compositions having excellent moldability and being capable of minimizing the decrease of the molecular weight of molded articles therefrom, which decrease would otherwise deteriorate their properties, whereby the molded articles have excellent properties such as tensile strength and elongation, compression set, heat resistance and resistance to hydrolysis, and to a process for producing the same. The present invention further relates to a polymer diol composition to be used for the above thermoplastic polyurethane compositions and to a process for producing the same. The present invention still further relates to molded articles and elastic fibers obtained from the above thermoplastic polyurethane compositions and processes for producing the same.

Brief Summary Text (5):

Upon manufacture of thermoplastic polyurethanes, various polymer diols are used as the raw material for constituting their soft segments and these diols include polyester diols, polyesterpolycarbonate diols, polycarbonate diols and polyether diols. Among these diols, polyester diols are most widely used, since they give thermoplastic polyurethanes having excellent mechanical properties.

Brief Summary Text (7):

Thermoplastic polyurethanes are obtained by subjecting to urethanization one of the above polymer diols, together with an organic diisocyanate such as 4,4'-diphenylmethane diisocyanate or naphthalene diisocyanate and a chain extender of a short-chain diol such as 1,4-butanediol.

Brief Summary Text (8):

However, thermoplastic polyurethanes obtained by conducting melt polymerization using an ester-based polymer diol having been obtained with a titanium compound catalyst, while the activity of the catalyst was not permitted to decrease after the polymer preparation, have insufficient uniformity in their properties, such as heat resistance and resistance to hydrolysis. Molded articles obtained by melt molding, such as injection molding or extrusion molding, of these polyurethanes are therefore inferior in such properties. There are also available thermoplastic polyurethanes obtained by melt polymerization of an ester-based polymer diol having been obtained with a titanium compound catalyst, which is then subjected to an activity-decreasing treatment. These

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Any inquiry of a general nature or relating to the status of this application should be directed to the receptionist whose telephone number is 703-308-0661.

U.K Rajguru/dh
September 10, 2002

polyurethanes will, upon melt molding thereof, tend to give molded articles sticking together. In this case also, the obtained molded articles tend to become inferior in tensile strength, elongation, compression set, heat resistance and like properties.

Brief Summary Text (10):

With the above former type of thermoplastic polyurethanes, during melt polymerization and melt molding thereof, the ends of short-chain diols formed by scission of the inside of the hard segments and the ends of other short-chain diols formed by scission of the inside of the soft segments originating from the polymer diol used undergo transesterification, whereby the blocks become no longer distinct from each other (that is, local randomization occurs) and, as a result, the properties of the thermoplastic polyurethanes and molded articles therefrom become non-uniform and inferior.

Brief Summary Text (11):

With the above latter type of thermoplastic polyurethanes, the urethanization reactivity decreases between the isocyanate groups and hydroxyl groups dissociated due to scission of the inside of the hard segments during melt molding, so that in the molded articles obtained the polyurethane can hardly recover the molecular weight and, as a result, these molded articles stick together or decrease their properties.

Brief Summary Text (12):

Accordingly, the present inventors have found that, in order to improve the above drawbacks it is important to maintain, during melt polymerization and melt molding, as unchanged as possible the chain length distribution of hard segments contained in a thermoplastic polyurethane and to permit the thermoplastic polyurethane molecules of articles molded therefrom to recover the molecular weight as quickly as possible after the molding.

Brief Summary Text (13):

As a result of a further study made by the present inventors, it has been found that the active titanium-based esterification catalyst remaining in the obtained polymer diol also develops catalytic activity for urethanization reaction in the succeeding melt polymerization zone for obtaining a thermoplastic polyurethane. Consequently, where the polymer diol is, after the activity of the titanium compound catalyst for esterification has been decreased, used for melt polymerization to produce a thermoplastic polyurethane, the resulting polyurethane has more uniform properties compared to one obtained with the activity of the catalyst having been not decreased. However, in this case, the productivity of the thermoplastic polyurethane necessarily decreases. Furthermore, upon melt molding of such a polyurethane, where the reactivity between the isocyanate groups and hydroxyl groups formed by dissociation during the melt molding decreases, the molecular weight of the polyurethane present in molded articles therefrom will not be sufficiently recovered and hence, as described above, sticking of molded articles, decrease in their properties and like troubles occur.

Brief Summary Text (14):

Accordingly, an object of the present invention is to provide a polyurethane composition having excellent moldability and being capable of giving molded articles with which the properties have been decreased, due to decrease in the molecular weight, only to a small extent and which have excellent properties such as tensile strength and elongation, compression set, heat resistance and resistance to hydrolysis.

Brief Summary Text (15):

Another object of the present invention is to provide a process for producing the above thermoplastic polyurethane composition in a high productivity and uniformly.

Brief Summary Text (16):

Still another object of the present invention is to provide a polymer diol composition useful as a raw material for producing the above thermoplastic polyurethane composition and a process for producing the same.

Brief Summary Text (17):

Yet another object of the present invention is to provide a molded article comprising the above thermoplastic polyurethane composition and a process for producing the same.

Brief Summary Text (18):

Yet another object of the present invention is to provide an elastic fiber comprising the above thermoplastic polyurethane composition and a process for producing the same.

Brief Summary Text (20):

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 1-5, 20 and 21, drawn to a composite composition, classified in class 524, subclass 47.
 - II. Claims 6-19, drawn to a process for preparing the composite composition of composites prepared, classified in class 106, subclass 310.

The inventions are distinct, each from the other because:

Inventions II and I are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the process as claimed can be used to make a materially different product such as a thermoplastic polymer together with an inorganic filler and of needed solvents.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art because of their recognized divergent subject matter, restriction for examination purposes as indicated is proper.

2. During a telephone conversation with Attorney Ellen T. Dec on August 12, 2002 a provisional election was made with traverse to prosecute the invention of 1, claims 1-5,

The present invention provides a thermoplastic polyurethane composition comprising:

Brief Summary Text (21):

a thermoplastic polyurethane (I) comprising a polymer diol component (A), an organic diisocyanate component (B) and a chain extender component (C), and

Brief Summary Text (22):

a tin compound (II) in an amount of 0.3 to 15 ppm as converted into tin atom based on said thermoplastic polyurethane (I);

Brief Summary Text (23):

said thermoplastic polyurethane composition having:

Brief Summary Text (24):

a retention ratio of long-chain hard segments containing at least 3 repeating units consisting of one unit from said organic diisocyanate and one unit from said chain extender and contained in said thermoplastic polyurethane (I), when said polyurethane composition is melt treated at 220.degree. C. for 60 minutes of at least 85%, and

Brief Summary Text (25):

a retention ratio of inherent viscosity when said polyurethane composition is melt treated at 220.degree. C. for 6 minutes and then melt extruded and, thereafter, allowed to stand at 20.degree. C., 60% RH (relative humidity) for 24 hours, of at least 85%. [hereinafter this thermoplastic polyurethane composition is referred to as "thermoplastic polyurethane composition (III)].

Brief Summary Text (26):

The present invention further provides a process for producing thermoplastic polyurethane compositions, which comprises conducting melt polymerization of a polymer diol obtained by affecting polymerization with a titanium-based esterification catalyst and then decreasing the activity of said titanium-based esterification catalyst, with an organic diisocyanate and a chain extender, in the presence of a tin compound.

Brief Summary Text (29):

The present invention yet further provides an elastic fiber comprising said thermoplastic polyurethane composition (III).

Brief Summary Text (30):

The present invention yet further provides a process for producing elastic fibers, which comprises melt spinning said thermoplastic polyurethane composition (III).

Brief Summary Text (31):

The present invention yet further provides a shaped article comprising said thermoplastic polyurethane composition (III).

Brief Summary Text (32):

The present invention yet further provides a process for producing shaped articles, which comprises melt molding said thermoplastic polyurethane composition (III) and heat treating the obtained molded products.

Drawing Description Text (2):

FIG. 1 is a GPC chart showing the chain length distribution of hard segment of a polyurethane in one embodiment of the thermoplastic polyurethane composition according to the present invention.

Detailed Description Text (2):

The thermoplastic polyurethane (I), which is a main component of the above thermoplastic polyurethane composition (III) consists essentially of a polymer diol component (A), an organic diisocyanate component (B) and a chain extender component (C).

Detailed Description Text (13):

These titanium-based esterification catalysts are used in an amount suitably selected according to the types of the intended polymer diol and the succeeding thermoplastic polyurethane, and the amount is not specifically limited. However, for producing polyester diols, the amount of the catalyst used is generally in a range of 0.1 to 50 ppm, preferably about 1 to 30 ppm, based on the amount of the raw materials (sum of the amounts of a dicarboxylic acid and a short-chain diol). If the amount of the catalyst is too small, it will take a significantly long time to produce the polymer diol and

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20 and 21. Affirmation of this election must be made by applicant in replying to this Office action. Claims 6-19 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

3...7.20...

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1-5, 20 and 21 are rejected under 35 U.S.C. 103(a) as being

unpatentable over Carter et al (USP 5,538,751) in view of Koubek et al (USP 5,641,349)

Carter discloses a thicken foodstuff containing a ~~non-pre~~ ^{non-pre} gelatinized ~~compose~~ ^{amylase} polymer and a biopolymer (abstract). The amylopectin component is a waxy-starch (col. 2, lines 46-67). Biopolymer is gum, xanthan, carboxymethyl cellulose etc (col. 15, lines 25-31). Amounts of starch and biopolymer are set forth in col. 3, lines 4-17.

the obtained polymer diol will sometimes become colored. On the other hand, if the amount of the titanium-based esterification catalyst is too large, the excess catalyst will no longer contribute to acceleration of the formation of the polymer diol and, rather, it will become difficult, after synthesis of the polymer diol, to decrease the activity of the catalyst to a sufficiently low level.

Detailed Description Text (14):

In order to obtain a thermoplastic polyurethane suitable for the thermoplastic polyurethane composition (III) according to the present invention, it is important, where the polymer diol to be used therefor has been produced by esterification polymerization in the presence of a titanium-based esterification catalyst, to decrease sufficiently the activity of the catalyst present in the obtained polymer diol. To decrease the activity of the titanium-based esterification catalyst, it is recommended to subject the polymer diol containing the catalyst to a deactivation treatment of the catalyst, which is easy and simple. Complex processes are generally required for separating the titanium-based esterification catalyst from the catalyst-containing polymer diol, as well as for separating the resulting titanium compound from the polymer diol after being subjected to deactivation treatment of the titanium-based esterification catalyst. It is therefore recommended to subject the polymer diol containing the titanium-based esterification catalyst to a catalyst deactivation treatment without removing the titanium-based esterification catalyst, and to use the treated polymer diol, without removing the deactivated titanium compound, to use as it is or, as desired, after addition of a tin compound, for the production of the intended polyurethane. However, the above deactivation treatment does not necessarily exclude removal of the titanium-based esterification catalyst from the catalyst-containing polymer diol and/or removal of the deactivated titanium compound from the titanium compound-containing polymer diol having been subjected to deactivation treatment. Such being the case, the process employed in the present invention for producing a polymer diol, which comprises conducting polymerization with a titanium-based esterification catalyst and then deactivating the titanium-based esterification catalyst, may include purification steps, such as a step of removing the titanium-based esterification catalyst from the catalyst-containing polymer diol or, after an deactivation treatment, a step of removing the deactivated titanium compound from the polymer diol containing it.

Detailed Description Text (15):

The above deactivation treatment for the titanium-based esterification catalyst present in the catalyst-containing polymer diol may be conducted either to eliminate substantially completely the catalytic activity of the titanium-based esterification catalyst, or to decrease it to a desired level. It is desirable that the deactivation be conducted by contacting with water the polymer diol containing the titanium-based esterification catalyst with heating. The deactivation may also be effected by adding a phosphorus compound, such as phosphoric acid, a phosphoric acid ester, phosphorous acid or a phosphorous acid ester, to the polymer diol containing the titanium-based esterification catalyst. However, this latter process, is not advantageous, since the process, requiring an at least equimolar amount of a phosphorus compound, tends to decrease the resistance to hydrolysis of the treated polymer diol and thermoplastic polyurethanes obtained therefrom. The deactivation treatment of the titanium-based esterification catalyst may be conducted either directly after the esterification polymerization or after a desired period.

Detailed Description Text (20):

The thermoplastic polyurethane (I) is obtained by reacting the above polymer diol, organic diisocyanate and chain extender.

Detailed Description Text (21):

In the production of the thermoplastic polyurethane (I), it is recommended to use a polymer diol, an organic di-isocyanate and a chain extender in such amounts as to permit the molar ratio between the moles of isocyanate groups present in the organic diisocyanate (B') and the total moles of active hydrogen atoms present in the polymer diol (A') and the chain extender (C'), $(B')/[(A')+(C')]$ to fall within a range of about 0.95 to about 1.3, preferably about 0.97 to about 1.1. If the molar ratio is too small, the molecular weight of the resulting polyurethane after molding will be recovered insufficiently, whereby the molded articles tend to become poor in heat resistance, compression set, strength and like properties. If the molar ratio is too large, the molecular weight of the polyurethane will decrease significantly during molding, so that the moldability tends to decrease and the hardness of the molded articles tends to change with elapse of time to a large extent.

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Carter does not mention the crosslinked starch (of instant claim 20).

Koubek discloses adhesives containing starches. Starches are chemically modified to produce crosslinked starches which exhibit an unchanged gelatinization temp. (col. 4, lines 23-31; col. 7, lines 26-29).

It would therefore have been obvious to use a chemically crosslinked starch in the foodstuff of Carter in order to make such foodstuff resistant to viscosity changes and to ensure that the temp. of gelatinization remains fairly unchanged.

5. Any inquiry concerning this communication from the examiner should be directed to U.K. Rajguru whose telephone number is 703-308-3224. The examiner can generally be reached on Monday-Friday 9:30 am-6:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, James J. Seidleck can be reached on 703-308-2462. The fax phone numbers for the organization where this application is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application should be directed to the receptionist whose telephone number is 703-308-0661.

U.K. Rajguru/dh
September 9, 2002

Detailed Description Text (22):

In the present invention, it is desirable that the thermoplastic polyurethane (I) have an inherent viscosity as determined on its 0.5 g/dl solution dissolved in a 1% by weight n-butylamine solution in dimethylformamide at 30.degree. C. of 0.5 to 2.0 dl/g, more preferably 0.7 to 2.0 dl/g, in view of the mechanical properties, heat resistance and the like of molded articles obtained therefrom.

Detailed Description Text (23):

The thermoplastic polyurethane composition (III) of the present invention consists essentially the above thermoplastic polyurethane (I) and a tin compound (II).

Detailed Description Text (25):

The tin compound (II) is, as described later herein, sometimes used, after being added to a polymer diol, for urethanization reaction of the polymer diol, an organic diisocyanate and a chain extender to obtain the thermoplastic polyurethane composition (III). In this case, the tin compound (II) used is preferably soluble in the polymer diol. The above exemplified tin compounds are preferable also in this respect.

Detailed Description Text (26):

The content of a tin compound (II) in the thermoplastic polyurethane composition (III) of the present invention is 0.3 to 15 ppm as converted into tin atom based on the amount of the thermoplastic polyurethane (I).

Detailed Description Text (27):

If the content of the tin compound (II) is less than 0.3 ppm as converted into tin atom, the resulting thermoplastic polyurethane composition will, when melt molded, give molded articles which readily stick together and have markedly poor physical properties, since the molecular weight of the polyurethane having decreased upon the molding is hardly recoverable. In addition, upon melt polymerization of a polymer diol with which the activity of the titanium-based esterification catalyst has been decreased, an organic diisocyanate and a chain extender in the presence of a tin compound (II) to produce a thermoplastic polyurethane composition, if the content of the tin compound in the resulting thermoplastic polyurethane is less than 0.3 ppm of tin atom, pellets of the obtained thermoplastic polyurethane composition will tend to stick together, since the polyurethane can hardly have a high molecular weight due to a low rate of re-increasing the molecular weight during the polymerization.

Detailed Description Text (28):

If the content of the tin compound (II) exceeds 15 ppm as converted into tin atom based on the thermoplastic polyurethane, the thermoplastic polyurethane will tend to have poor heat resistance, resistance to hydrolysis and like properties. That is, a thermoplastic polyurethane having a tin compound content exceeding 15 ppm gives, upon melt molding, in particular extrusion molding, molded articles being inferior in heat resistance, compression set, tensile strength and elongation and like properties, since the content of long-chain hard segments in the polyurethane molecules decreases to a markedly low level.

Detailed Description Text (29):

From the viewpoint of obtaining melt molded products having particularly good heat resistance, compression set and tensile strength and elongation and the like, the content of the tin compound is preferably in a range of 0.5 to 12 ppm as converted into tin atom based on the thermoplastic polyurethane (I).

Detailed Description Text (31):

The thermoplastic polyurethane composition (III) of the present invention has, when melt treated at 220.degree. C. for 60 minutes, a retention ratio of long-chain hard segments (hard segments having at least 3 repeating units consisting of one unit from the organic diisocyanate and one unit from the chain extender) of at least 85% in the thermoplastic polyurethane (I).

Detailed Description Text (32):

Among a polymer diol component (A), an organic diisocyanate component (8) and a chain extender component (C), components (B) and (C) generally constitute the hard segments present in molecules of the thermoplastic polyurethane (I). A hard segment comprises at least one repeating unit formed by addition of one unit from (B) and one unit from (C) or comprises one unit from (B). The above "long-chain hard segment" means hard segments containing at least 3 units of the above repeating unit. The retention ratio of long-chain hard segments in the thermoplastic polyurethane composition (III) is herein obtained by determining the content (% by weight) of long-chain hard segments based on

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claims 1, 3-7 and 15, drawn to a composition, classified in class 524, subclass 493.

II. Claims 2 and 8-14, drawn to a process, classified in class 524, subclass 493.

2. The inventions are distinct, each from the other because:

3. Inventions II and I are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the process as claimed can be used to make a materially different product such as a composition containing a thermosetting resin and a filler such as calcium carbonate, glass etc..

4. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art because of their recognized divergent subject matter, restriction for examination purposes as indicated is proper.

2/5. During a telephone conversation with Attorney Alvin T. Rockhill on 8/14/02 a provisional election was made with traverse to prosecute the invention of group I, claims 1, 3-7 and 15. Affirmation of this election must be made by applicant in replying to this Office action. Claims 2 and 8-14 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

3/6. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the

total hard segments present in the thermoplastic polyurethane of the thermoplastic polyurethane composition (III) and that after having melt treated the thermoplastic polyurethane composition (III) at 220.degree. C. for 60 minutes, and calculating the ratio of the latter to the former. The hard segments in a thermoplastic polyurethane can be determined as follows. A thermoplastic polyurethane composition sample is subjected to a reaction that cuts the ester bonds in the polyurethane molecules, thereby converting the hard segments into urethane diol compounds with the main part of their molecular chains consisting of at least one repeating unit containing units from component (8) and component (C) or consisting of at least one unit from component (B), to each of the ends of the molecular chains a short-chain diol that has constituted the ends of component (A) bonds by urethanization. The reaction for cutting the ester bonds in the polyurethane molecules is effected by swelling the thermoplastic polyurethane composition sample by contacting it with a small amount of tetrahydrofuran, then placing the swollen sample in a 0.01N solution of potassium hydroxide in methanol and stirring the mixture at 50.degree. C. for 5 days. Accordingly, in the determination of the long-chain hard segment content in the thermoplastic polyurethane composition (III), fragments comprising an organic diisocyanate component and a short-chain diol component and fragments comprising an organic diisocyanate component, a chain extender component and a short-chain diol component are deemed as hard segments.

Detailed Description Text (33):

FIG. 1 is a GPC chart showing the chain length distribution of hard segment of a polyurethane in one embodiment of the thermoplastic polyurethane composition (III) according to the present invention (as obtained in Example 4 to be described later). In this example, hard segments of the polyurethane comprise either: 4,4'-diphenylmethane diisocyanate component corresponding to an organic diisocyanate component, 1,4-butanediol component corresponding to a chain extender component and 3-methyl-1,5-pentanediol component corresponding to a short-chain diol having constituted the molecular ends of a polymer diol component, or the 4,4'-diphenylmethane diisocyanate component and the 3-methyl-1,5-pentanediol component. In FIG. 1, numerals put on the peaks represent the number of repeating units consisting of a 4,4'-diphenylmethane diisocyanate unit and a 1,4-butanediol unit, in the hard segments occupying the peaks. However, in this example, all cases with a repetition number of at least 4 are temporarily expressed as 4, because, with the repetition number being at least 4, peaks were not separated clearly. Thus, the hard segments shown by an integer of 0 to 4 in FIG. 1 have the following structures.

Detailed Description Text (40):

The melt treatment of a sample of the thermoplastic polyurethane composition (III) upon determination of the retention ratio when heat melted of long-chain hard segments can be conducted by, for example, after dewatering and drying the sample, kneading it in a melted state in a laboratory plasto mill at 220.degree. C. for 60 minutes.

Detailed Description Text (41):

The long-chain hard segment content and the retention ratio of long-chain hard segments after being heat melted depend on the level of decrease in the activity of the titanium-based esterification catalyst present in the polymer diol used for producing the thermoplastic polyurethane. With the remaining titanium-based esterification catalyst having a high activity, the apparent rate constant (k) of reaction of the polymer diol with 4,4'-diphenylmethane diisocyanate becomes high, which accelerates the urethanization reaction, but the thermoplastic polyurethane obtained by melt polymerization tends to have a low content of long-chain hard segments and has a retention ratio of long-chain hard segments when heat melted of less than 85%. Thermoplastic polyurethanes with a high activity of remaining titanium-based esterification catalyst have poor moldability and can only give, upon melt molding, molded articles having poor properties, such as tensile strength and elongation, compression set, heat resistance and resistance to hydrolysis. It is therefore very important, for the purpose of maintaining at at least 85% the retention ratio when heat melted of long-chain hard segments in a thermoplastic polyurethane, that the activity of the titanium-based esterification catalyst be sufficiently low.

Detailed Description Text (42):

The thermoplastic polyurethane composition (III) of the present invention has a retention ratio of inherent viscosity, after the composition has been melt treated at 220.degree. C. for 6 minutes and then melt extruded and, thereafter, allowed to stand at 20.degree. C., 60% RH (relative humidity) for 24 hours, of at least 85%.

Detailed Description Text (43):

Where, as described above, the activity of the titanium-based catalyst in a

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 1, 3-7 and 15, drawn to a composition, classified in class 524, subclass 493.
 - II. Claims 2 and 8-14, drawn to a process, classified in class 524, subclass 493.
2. The inventions are distinct, each from the other because:
3. Inventions II and I are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the process as claimed can be used to make a materially different product such as a composition containing a thermosetting resin and a filler such as calcium carbonate, glass etc..
4. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art because of their recognized divergent subject matter, restriction for examination purposes as indicated is proper.
5. During a telephone conversation with Attorney Alvin T. Rockhill on 8/14/02 a provisional election was made with traverse to prosecute the invention of group I, claims 1, 3-7 and 15. Affirmation of this election must be made by applicant in replying to this Office action. Claims 2 and 8-14 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.
6. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the

thermoplastic polyurethane is sufficiently low, it becomes possible to maintain the retention ratio when heat melted of long-chain hard segments at at least 85%. However, in order to maintain the retention ratio of inherent viscosity after melt extrusion at at least 85%, it is important that the thermoplastic polyurethane composition contain a tin compound in an appropriate amount within the range of 0.5 to 15 ppm.

Detailed Description Text (44):

The presence of a tin compound, having a high urethanization catalytic activity, increases the apparent rate constant (k) of reaction of a polymer diol with the titanium-based catalyst having been decreased to a sufficiently low level and 4,4'-diphenylmethane diisocyanate (MDI). With a thermoplastic polyurethane composition obtained by melt polymerization using a polymer diol containing a titanium-based esterification catalyst whose activity has been decreased sufficiently and in the presence of an appropriate amount of a tin compound, it becomes possible not only to obtain a high hard segment content and a retention ratio when heat melted of long-chain hard segments of at least 85%, but to achieve a retention ratio of inherent viscosity after melt extrusion of at least 85%. The thus obtained thermoplastic polyurethane composition, having a retention ratio when heat melted of long-chain hard segments of at least 85% and a retention ratio of inherent viscosity after melt extrusion of at least 85%, has excellent moldability and can give molded articles having excellent tensile strength and elongation, compression set, heat resistance, resistance to hydrolysis and like properties.

Detailed Description Text (45):

Known esterification catalysts for the production of a polymer diol include, besides titanium-based catalysts, tin-based ones, too. However, the use of a tin-based esterification catalyst, having lower esterification catalytic activity compared to titanium-based esterification catalysts, in a low concentration as is used with titanium-based catalysts, is not practical, since it requires a long time to permit the obtained polymer diol to achieve a molecular weight of a desired level. The use of a tin-based esterification catalyst in a high concentration, which can shorten the production time for the desired polymer diol, is not preferred, since the thermoplastic polyurethane obtained from the resulting polymer diol will tend to have a low retention ratio when heat melted of long-chain hard segments.

Detailed Description Text (46):

It is desirable, from the viewpoint of shortening the urethanization polymerization time, that the thermoplastic polyurethane composition (III) of the present invention be produced by the successive steps of obtaining a polymer diol by polymerization in the presence of a titanium-based esterification catalyst, decreasing the activity of the titanium-based catalyst contained in the polymer diol and polymerizing the polymer diol, an organic diisocyanate and a chain extender in the presence of a tin compound (II) in a prescribed concentration. That is, although it is possible to add a tin compound (II) after preparation of a thermoplastic polyurethane (I), it is more preferred to add it before completion of the polymerization of a polymer diol, an organic diisocyanate and a chain extender. This is because, in this manner, the thermoplastic polyurethane (I) can be produced uniformly and in a high productivity. It is therefore recommended to add a tin compound (II) during the production of a polymer diol, during the period after the production of the polymer diol and before starting the polymerization of a thermoplastic polyurethane, or during the polymerization for the thermoplastic polyurethane. Among the above, it is particularly beneficial in practice to add a tin compound (II) to a polymer diol, thereby using the tin compound (II) for the urethanization polymerization of the polymer diol, an organic diisocyanate and a chain extender. The tin compound can be added to a polymer diol while the polymer diol is, as required with heating, being stirred.

Detailed Description Text (47):

Known urethanization techniques can be used for the polymerization of a polymer diol, an organic diisocyanate and a chain extender, to obtain thermoplastic polyurethanes usable in the present invention. According to a study made by the present inventors, melt polymerization, in particular one in the presence of substantially no solvent is preferred, and continuous melt polymerization with a multi-screw extruder is more particularly preferred. Thermoplastic polyurethanes obtained by continuous melt polymerization have better uniformity and strength and, when molded into a film, cause fish eyes to form in a smaller number, compared to those obtained by, for example, bulk polymerization at a temperature of 80.degree. to 130.degree. C. The melt polymerization temperature is not specifically limited, but in general it is preferably in a range of 180.degree. to 260.degree. C. At temperatures not more than 260.degree. C., the obtained thermoplastic polyurethanes can possess increased heat resistance and

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currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

7. Claims 1, 3-7 and 15 are under examination.

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

MR 10. Claims 1, 3-7 and ~~15~~ are rejected under 35 U.S.C. 103(a) as being unpatentable over Mabry et al (USO 6075084) in view of Sandstorm et al (USP 6378582).

Mabrey describes elastomer composite blends and method. Suitable elastomer latex fluids include both natural and synthetic elastomer lattices and latex blends. Styrene-butadiene rubber is one of the suitable lattices (col. 11, line 50 to col. 12, line 27). Certain fillers are also used. Fumed silica and precipitated silica are suitable filers (col. 14, line 6-14). ~~They~~ ^{They} possess an aspect ratio less ~~than~~ ^{than} 40 (col. 15, lines 47-50).

moldability. At temperatures above 180.degree. C., the obtained thermoplastic polyurethanes can be provided with good moldability and give molded products having good properties.

Detailed Description Text (48):

During or after completion of polymerization for the thermoplastic polyurethane, additives may be appropriately added thereto, such as a color, lubricant, crystallization nucleus agent, flame retardant, UV absorber, antioxidant, stabilizer against hydrolysis and mildew-resistant agent.

Detailed Description Text (49):

While the effect of the present invention is produced by thermoplastic polyurethanes having various hardnesses, it is most markedly produced by those having a low JIS-A hardness of not more than 75. This is considered to be due to the fact that: while a polymer diol having a relatively high molecular weight is suitably used for producing a low-hardness polyurethane, the tin compound present in the system markedly increases the urethanization reactivity which would otherwise be decreased resulting, presumably, from a low compatibility between the high-molecular-weight polymer diol and the organic diisocyanate used. From this viewpoint, the effect of the present invention, which is to provide thermoplastic polyurethane compositions having excellent moldability and being capable of giving molded products having excellent properties such as tensile strength and elongation, compression set, heat resistance and resistance to hydrolysis, is produced particularly markedly in the following representative embodiments. That is, the most desirable thermoplastic polyurethanes (I) are obtained by polymerizing:

Detailed Description Text (55):

The thermoplastic polyurethane compositions (III) of the present invention can be subjected to melt molding, such as injection molding or extrusion molding, and the obtained molded articles can show excellent performances stably upon heat treatment after the melt molding. The heat treatment is preferably conducted by heating at a temperature of 50.degree. to 110.degree. C. for 1 to 24 hours.

Detailed Description Text (56):

When the thermoplastic polyurethane compositions (III) of the present invention are melt molded by injection molding, extrusion molding or like processes, the molecular weight after the melt molding rapidly recovers (increases), whereby the decrease in the properties, as well as, sticking of molded articles is suppressed. The thermoplastic polyurethane compositions (III) therefore have excellent moldability and give molded products being excellent in tensile strength and elongation, compression set, heat resistance, resistance to hydrolysis and like properties. Thanks to these features, the thermoplastic polyurethane compositions (III) are applicable to a wide variety of end-uses, such as sheets, films, rolls, gears, solid tires, belts, hoses, tubes, packings, air bags, wrist straps, shock-proof materials, shoe soles, sports shoes, machine parts, automobile parts, sporting goods and artificial leathers.

Detailed Description Text (57):

Furthermore, the thermoplastic polyurethane compositions (III) of the present invention produce an excellent effect when used for producing elastic polyurethane fibers by melt spinning.

Detailed Description Text (58):

· Elastic polyurethane fibers obtained by melt spinning have excellent heat settability, abrasion resistance, resistance to chlorine, transparency and like properties and are of low production costs, and have hence attracted much attention and been produced in increasing amounts. However, with a conventional thermoplastic polyurethane, the molecular weight decreases just after the polyurethane has been melt extruded, because of thermal dissociation of isocyanate groups and hydroxyl groups. After being extruded through spinning nozzles, urethane bonds will re-form and the molecular weight of the polyurethane will recover (increase) as cooling proceeds, thereby rendering it possible to take up extruded filaments. However, if the molecular weight increases on this occasion too slowly, the extruded filaments tend to break and, after being taken up, the filaments tend to stick together and cause poor unwinding capability.

Detailed Description Text (59):

The thermoplastic polyurethane compositions (III) of the present invention, having a high urethanization reactivity, give elastic fibers having excellent processability during warping, knitting, dyeing or like processes, while suppressing filament breakages and sticking during spinning, without deteriorating the excellent hot water resistance, resistance to hydrolysis and like properties inherent to thermoplastic

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Though Mabrey discloses the aspect ratio, there is no mention about the size of silica particle.

Sandstorm describes silica-reinforced tire tread rubber. Tread is comprised of (1) 10 to 35 phr of vinyl butadiene rubber, (2) 65 to 90 phr of isoprene butadiene rubber, (3) 30 to 90 phr silica, (4) 5-50 phr black, (5) ~~52~~² to 50 phr of processing oil and (6) 0.5 to 15 phr of silica complying agent (col. 17, lines 23-37). Average particle size of silica is 0.01 to 0.05 micron (i.e. 10 to 50 nanometers) (col. 8~~m~~ lines 40-44).

Therefore it would have been obvious (from teachings of Sandstorm) that since suitable silica particle size lies between 10 to 50 nanometers the dimensions of the silica particles used by Mabry (based on aspect ratio of 40 maximum) are $(10 \times 40 =) 400$ nanometers to $(50 \times 40 =) 2000$ nanometers.

In this case the dimensions of particle of silica, disclosed by prior art are not exactly same as those that are instantly claimed. Nonetheless it is the examiner's position that one of ordinary skill in the art can always vary these dimensions in order to enhance dispersion of silica in polymeric matrix and also to better stabilize the dispersion so prepared.

// Any inquiry concerning this communication or earlier communications from the examiner should be directed to U. K. Rajguru whose telephone number is 703 308-3224. The examiner can normally be reached on Monday-Friday from 9:30 am to 6:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, James J. Seidleck can be reached on 703 308-2462. The fax phone numbers for the organization where this application or proceeding is assigned are 703 872-9310 for regular communications and 703 872-9311 for After Final communications.

polyurethane. The thermoplastic polyurethane compositions (III) of the present invention can also be subjected to high-speed spinning.

Detailed Description Text (61):

In the Examples and Comparative Examples that follow, the following methods were used to determine, for thermoplastic polyurethane samples, the reactivity of polymer diol with isocyanate groups, inherent viscosity, content of long-chain hard segments (long-chain HS content) and its retention ratio when heat melted, retention ratio of inherent viscosity, tensile strength and elongation, hardness, moldability (deformation upon molding), compression set, Vicat softening point (heat resistance), cold resistance and resistance to hydrolysis; and, for elastic fibers, the tensile strength and elongation, elastic recovery ratio, hot water resistance, resistance to hydrolysis and filament breakage rate.

Detailed Description Text (72):

A polyurethane sample in the form of pellets (melt extruded strands are cut and then dried at 80.degree. C. for 4 hours), injection molded articles (having been allowed to stand at 80.degree. C. for 4 hours after being injection molded) or elastic polyurethane fibers is dissolved in a concentration of 0.5 g/dl in a 1% by weight n-butylamine solution in N,N-dimethylformamide. The solution is allowed to stand at 20.degree. C. for 24 hours and then measured with an Ubbelohde viscometer for falling time at 30.degree. C. The inherent viscosity at 30.degree. C. is calculated by:

Detailed Description Text (78):

A 2-g sample taken from polyurethane or from molded article therefrom is swollen by addition of 5 ml of tetrahydrofuran (THF). After 2 hours, 25 ml of a 0.01N potassium hydroxide solution is added and the mixture is stirred at 50.degree. C. for 5 days, to decompose (cut the ester bonds of) the polyurethane. After the decomposition, the solvent is removed by evaporation at 50.degree. C. within 2 hours. The residue is placed in 1000 ml of water and the mixture is filtered through a filter paper, to give compounds resulting from hard segments. The compounds are sufficiently dried and 0.020 g is weighed therefrom. The weighed specimen is dissolved in a mixture of 2.0 ml of N-methylpyrrolidone (NMP) and 6.0 ml of THF, and the obtained solution is subjected to GPC (gel permeation chromatography) with the following apparatuses and under the following conditions:

Detailed Description Text (85):

A 20- μ l sample is injected and the solvent (THF) is flown at a rate of 1.0 ml/min. In the analysis after measurement, the area between the elution curve and the base line is obtained. Only incompletely separable peaks are treated by vertical division method as shown in FIG. 1. Although those polyurethanes that have used a mixture of at least 2 compounds as chain extenders or as organic diisocyanates may sometimes cause shoulder part to form at each peak, this will not cause problems in the separation of peaks. Compounds originating from hard segments having at least 3 repeating units consisting of units from an organic diisocyanate and a chain extender are defined as long-chain hard segments. The GPC a real fraction of the long-chain hard segment based on total hard segments is taken as the long-chain hard segment content (% by weight).

Detailed Description Text (87):

A 60-g polyurethane sample is dewatered under vacuum at 90.degree. C. for 3 hours and then kneaded in a melting state with a laboratory plasto mill (made by Toyo Seiki Co.) at 220.degree. C. for 60 minutes under an atmosphere of nitrogen. The long-chain hard segment content is determined in the above manner for samples both before and after kneading. The retention ratio when heat melted is defined as the ratio of the long-chain hard segment content after kneading to that before kneading.

Detailed Description Text (89):

A 2-g polyurethane sample is dewatered under vacuum at 90.degree. C. for 3 hours and then melted and kept in a flow tester (CFT-500, made by Shimadzu Corp.) at 220.degree. C. for 6 minutes and melt extruded. The extrudates are allowed to stand at 20.degree. C., 60% RH for 24 hours. The sample before being melted (after vacuum-dewatering) and the extrudates after being kept at 20.degree. C. are each tested for inherent viscosity. The retention ratio of inherent viscosity is defined as the ratio of the inherent viscosity of the extrudates to that of the polyurethane before melting.

Detailed Description Text (91):

JIS K-7311 is applied. That is, a 2-mm thick polyurethane sample sheet is obtained by injection molding and dumbbell test specimens are prepared therefrom. The specimens are tested for tensile strength and elongation at break at an extension rate of 30 cm/min.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703 305-0661.

Examiner Rajguru/ng
August 29, 2002

Detailed Description Text (92):

Tensile strength and elongation of elastic polyurethane fiber

Detailed Description Text (95):

Six plies of a 2-mm thick polyurethane sample sheet are laid on each other and measured for the hardness with a Shore A hardness tester.

Detailed Description Text (97):

A polyurethane sample is injection molded with a die having a diameter of 120 mm into 2-mm thick discs. The discs are measured for the diameter in the direction of injection. The deformation when molded is defined as the ratio of the length shrunk to the size of the mold, as follows:

Detailed Description Text (105):

Specimens prepared from a 2-mm thick polyurethane sheet are tested for dynamic viscoelasticity at a frequency of 11 Hz. The temperature (T.alpha.) at which the dynamic elasticity loss (E'') reaches the maximum is taken as an index of cold resistance.

Detailed Description Text (107):

Dumbbell specimens prepared from a 2-mm thick polyurethane sheet sample are allowed to stand at 70.degree. C., 95% RH for 21 days. The specimens are tested for tensile strength before and after this exposure. The retention ratio between the strength after the exposure and that before the exposure is taken as an index of resistance to hydrolysis.

Detailed Description Text (108):

Elastic recovery ratio of elastic polyurethane fiber

Detailed Description Text (113):

Hot water resistance of elastic polyurethane fiber

Detailed Description Text (119):

Resistance to hydrolysis of elastic polyurethane fiber

Detailed Description Text (120):

A polyurethane filament sample having a fineness of 40 deniers is allowed to stand in a free condition at 70.degree. C., 95% RH for 35 days. The tensile strength of the sample is measured before and after the above treatment. The retention ratio between the strength after the treatment and that before the treatment is taken as an index of resistance to hydrolysis.

Detailed Description Text (124):

.smallcircle.: not more than 0.01 time/kg-polyurethane

Detailed Description Text (125):

.DELTA.: 0.01 to 0.05 time/kg-polyurethane

Detailed Description Text (126):

.times.: at least 0.05 time/kg-polyurethane

Detailed Description Text (143):

Continuous melt polymerization was conducted at a temperature of 240.degree. to 250.degree. C. by feeding through metering pumps to a 30-.phi. same-direction twin-screw extruder with an L/D of 36, the PMPA composition E heated at 80.degree. C., 1,4-butanediol (BD) heated at 80.degree. C. and MDI heat melted at 50.degree. C., in such amounts as to make the molar ratio .multidot.(PMPA:BD:MDI) 1:3:4.01 and in a total rate of 300 g/min. The obtained melts of a thermoplastic polyurethane were extruded into water to form a strand, which was then cut with a pelletizer into pellets.

Detailed Description Text (144):

The pellets thus obtained were dried at 80.degree. C. for 20 hours and then tested for inherent viscosity, long-chain hard segment content and its retention ratio when heat melted and retention ratio of inherent viscosity. The pellets were also injection molded into a 2-mm thick polyurethane sheet. The sheet was allowed to stand at 80.degree. C. for 8 hours and then tested for inherent viscosity. Separately, dumbbell specimens were prepared from the sheet and tested for tensile strength and elongation, hardness, deformation when molded, compression set, Vicat softening point, cold

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Therefore it would have been obvious to one that the brominated epoxy compound and brominated ²polyacrylate as disclosed by JP '847 can be used as ingredients in the molding compound of Breitenfellner. It would also be obvious to use the polytetramethylene terephthalate polyester of Miyashita as the preferred polyester in the molding compound of Breitenfellner, in order to enhance mechanical ~~Miyashita et al., lines 64-68~~ strength and thermal stability. It would have also been obvious to reuse already used flame retardants in order to reduce cost.

5. - Any inquiry concerning this communication or earlier communications from the examiner should be directed to U.K. Rajguru whose telephone number is 703-308-3224. The examiner can normally be reached on Monday-Friday from 9:30am to 6:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, James J. Seidleck, can be reached on (703) 703-308-2462. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9311/9311.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

UKRajguru:evh

8/23/02

resistance and resistance to hydrolysis.

Detailed Description Text (148):

Example 1 was repeated except that the PMPA composition F was used, to conduct continuous melt polymerization, pelletization and drying, to obtain pellets of a thermoplastic polyurethane. Various evaluations were made on the pellets and molded articles therefrom, in the same manner.

Detailed Description Text (152):

Example 1 was repeated except that the PBA composition C, BD and MDI were continuously fed through metering pumps in such amounts as to make the molar ratio thereof 1:3.2:4.2 and in a total rate of 300 g/min, to conduct continuous melt polymerization, pelletization and drying, to obtain pellets of a thermoplastic polyurethane. Various evaluations were made on the pellets and molded articles therefrom, in the same manner.

Detailed Description Text (156):

Example 1 was repeated except that the PMPA composition G, BD and MDI were continuously fed through metering pumps in such amounts as to make the molar ratio thereof 1:3.7:4.72 and in a total rate of 270 g/min, to conduct continuous melt polymerization, pelletization and drying, to obtain pellets of a thermoplastic polyurethane. Various evaluations were made on the pellets and molded articles therefrom, in the same manner.

Detailed Description Text (160):

Example 1 was repeated except that the PMPA composition H, BD and MDI were continuously fed through metering pumps in such amounts as to make the molar ratio thereof 1:2.8:3.8 and in a total rate of 270 g/min, to conduct continuous melt polymerization, pelletization and drying, to obtain pellets of a thermoplastic polyurethane. Various evaluations were made on the pellets and molded articles therefrom, in the same manner.

Detailed Description Text (164):

Example 1 was repeated except that the PMPA composition I, BD and MDI were continuously fed through metering pumps in such amounts as to make the molar ratio thereof 1:2.5:3.52 and in a total rate of 270 g/min, to conduct continuous melt polymerization, pelletization and drying, to obtain pellets of a thermoplastic polyurethane. Various evaluations were made on the pellets and molded articles therefrom, in the same manner.

Detailed Description Text (167):

Example 1 was repeated except that the PMPA of which the titanium-based esterification catalyst had not been deactivated (PMPA-A) was used as it was (without addition of a tin compound), to conduct continuous melt polymerization, pelletization and drying, to obtain pellets of a thermoplastic polyurethane. Various evaluations were made on the pellets and molded articles therefrom, in the same manner.

Detailed Description Text (171):

The feed rate of the raw materials was then decreased to 200 g/min, whereby the pelletization became possible. The pellets were dried in the same manner. Various evaluations were made on the obtained thermoplastic polyurethane pellets and molded articles therefrom, in the same manner.

Detailed Description Text (174):

Example 1 was repeated except that the PMPA of which the titanium-based esterification catalyst had not been deactivated (PMPA-C) was used as it was (without addition of a tin compound) and that the composition of raw materials was changed as shown in Table 3, to conduct continuous melt polymerization, pelletization and drying, to obtain pellets of a thermoplastic polyurethane. Various evaluations were made on the pellets and molded articles therefrom, in the same manner.

Detailed Description Text (178):

The feed rate of the raw materials was then decreased to 100 g/min, whereby the pelletization became possible. The pellets were dried in the same manner. Various evaluations were made on the obtained thermoplastic polyurethane pellets and molded articles therefrom, in the same manner.

Detailed Description Text (182):

Example 6 was repeated except that the PMPA composition J was used, to conduct

DETAILED ACTION

1. . Claims 1-12 are under examination.

2.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1, 4 and 12 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 is indefinite in reciting ~~it~~ "finely divided" (lines 1 and 3) "unconsolidated sheet like structures" (lines 2 and 6) and "temperatures above 120°C" (line 5) since it is not clear how fine is finely divided?, what is an unconsolidated sheet like structure and what is the upper limit of temperature. This claim is further vague since it requires ~~X~~ to be OH or NH₂ if Y is hydrogen; but Y is never ~~X~~ hydrogen. Similarly X is never ~~X~~ hydrogen. Meaning of sentence "X and Y are together a π bond" is also not understood. (Examiner assumes that X and &Y may be meant to be connected by a double bond).

Similar remarks apply to claims 4 and 12.

3. . The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

continuous melt polymerization, pelletization and drying, to obtain pellets of a thermoplastic polyurethane. Various evaluations were made on the pellets and molded articles therefrom in the same manner.

Detailed Description Text (191):

Continuous melt polymerization was conducted at a temperature of 240.degree. to 250.degree. C. by feeding through metering pumps to a 30-.phi. same-direction twin-screw extruder with an L/D of 36, the PMAZ composition C heated at 80.degree. C., 1,4-butanediol (BD) heated at 80.degree. C. and MDI heat melted at 50.degree. C., in such amounts as to make the molar ratio (PMAZ:BD:MDI) 1:2:3.09. The thermoplastic polyurethane melts that formed were directly fed to a spinning machine, and spun at a spinning temperature of 220.degree. C., a dew point of cooling air of 10.degree. C. and a spinning speed of 500 m/min, into a 40 denier/1 filament elastic polyurethane filament, which was wound up on several bobbins.

Detailed Description Text (193):

Separately, one of the bobbins having taken up the elastic filament was allowed to stand at 25.degree. C., 50% RH (relative humidity) for 24 hours and the filament was tested for inherent viscosity. Another bobbin was dried at 40.degree. C. under a reduced pressure for 3 hours, and the polyurethane of the elastic filament and that obtained by kneading the polyurethane at 220.degree. C. for 60 minutes in a melted state were each subjected to alkaline hydrolysis, to yield hard segments, which were then analyzed by GPC. The retention ratio when heat melted of long-chain hard segments was thus obtained.

Detailed Description Text (196):

Example 7 was repeated except that the spinning was conducted at a spinning speed of 800 m/min, to conduct polymerization and spinning. The elastic polyurethane filament obtained was tested for properties.

Detailed Description Text (200):

Example 7 was repeated except that the PMAZ composition D was used, to conduct polymerization and spinning. The elastic polyurethane filament obtained was tested for properties.

Detailed Description Text (204):

Example 7 was repeated except that the PMPA composition K was used, to conduct polymerization and spinning. The elastic polyurethane filament obtained was tested for properties.

Detailed Description Text (208):

Example 7 was repeated except that the PMPA composition L was used, to conduct polymerization and spinning. The elastic polyurethane filament obtained was tested for properties.

Detailed Description Text (211):

Example 7 was repeated except that the PMAZ (PMAZ-A) obtained in Reference Example 6 was used as it was (without addition of a tin compound), to conduct polymerization and spinning. The elastic polyurethane filament obtained was tested for properties.

Detailed Description Text (214):

Example 7 was repeated except that the PMAZ (PMAZ-B) obtained in Reference Example 7 was used as it was (without addition of a tin compound), to conduct polymerization and spinning. The elastic polyurethane filament obtained was tested for properties.

Detailed Description Text (217):

Example 7 was repeated except that the PMAZ (PMAZ-A) obtained in Reference Example 6 was used as it was (without addition of a tin compound) and that the spinning speed was changed to 800 m/min, to conduct polymerization and spinning. The elastic polyurethane filament obtained was tested for properties.

Detailed Description Text (220):

Example 7 was repeated except that the PMAZ (PMAZ-B) obtained in Reference Example 7 was used as it was (without addition of a tin compound) and that the spinning speed was changed to 800 m/min, to conduct polymerization and spinning. The elastic polyurethane filament obtained was tested for properties.

Detailed Description Text (224):

Example 7 was repeated except that the PMAZ composition E was used and that the spinning

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This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103© and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. . Claims 1-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dotzauer et al (CA 2037214) *Next paragraph* (Dotzauer is of record on PTO-1449, paper no. 3).

Dotzauer discloses boards made out of a composition comprising *finely* ~~fine~~ divided materials, high molecular weight polycarboxylic acids ~~and~~ polyhydric alcohols and alkanolamines or polyamines (p. 1, lines 28-33). Suitable finely divided materials are described on p. 1, lines 34-37. Composition is molded ^{to} ~~is~~ form sheets under heat and pressure (p. 4, line 17 to p. 5, line 31). *Patentee discloses amides on p. 3, line 11.*

~~It is~~ *It* would therefore have been obvious to follow teachings of Dotzauer and arrive at instantly claimed invention.

5. - The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

speed was changed to 800 m/min, to conduct polymerization and spinning. The elastic polyurethane filament obtained was tested for properties.

Detailed Description Text (226):

As is understood from Tables 2 through 6, thermoplastic polyurethanes containing no tin compound and obtained by urethanization polymerization using a polymer diol with the titanium-based esterification catalyst having been not deactivated, give injection molded articles and elastic fibers which are inferior in heat resistance (Vicat softening point) and resistance to hydrolysis (compare Examples 1 and 2 with Comparative Example 1, Examples 4 through 6 with Comparative Example 3 and Examples 7 through 9 with Comparative Examples 6 and 8).

Detailed Description Text (227):

It is also understood that the use of a polymer diol with the titanium-based esterification catalyst having been deactivated, in urethanization polymerization in the absence of a tin compound, causes the productivity for polyurethane to become low, the resulting polyurethane to have a low molecular weight (inherent viscosity), thereby achieving only a small increase in molecular weight after being injection molded, and to give molded articles being inferior in strength, compression set and like properties (Comparative Examples 2 and 4). This type of polyurethane causes, upon preparation of elastic polyurethane fibers, frequent filament breakage, which is more serious when the spinning speed becomes higher (Comparative Examples 7 and 9).

Detailed Description Text (228):

The following is also understood. Even with a thermoplastic polyurethane composition obtained by urethanization polymerization in the presence of a tin compound and using a polymer diol with the titanium-based esterification catalyst having been deactivated, if the content of the tin compound exceeds 15 ppm as converted into tin atom, molded articles from the thermoplastic polyurethane composition are inferior in strength, compression set, heat resistance (Vicat softening point) and resistance to hydrolysis (Comparative Example 5). Further in this case, upon production of elastic fibers from the thermoplastic polyurethane composition, the filament breakage rate becomes high and the obtained elastic filaments are also poor in strength, hot water resistance and resistance to hydrolysis (Comparative Example 10).

Detailed Description Text (230):

The thermoplastic polyurethane compositions according to the present invention have excellent moldability and give molded products being excellent in tensile strength and elongation, compression set, resistance to hydrolysis and like properties. Thanks to these features, the thermoplastic polyurethane compositions are applicable to a wide variety of end-uses, such as sheets, films, rolls, gears, solid tires, belts, hoses, tubes, packings, air bags, wrist straps, shock-proof materials, shoe soles, sports shoes, machine parts, automobile parts, sporting goods and artificial leathers.

Detailed Description Text (231):

The thermoplastic polyurethane compositions according to the present invention also have excellent spinnability and give fibers having excellent hot water resistance, resistance to hydrolysis, unwindability and like properties, and are hence also useful as materials for elastic fibers. resistance to hydrolysis, unwindability and like properties, and are hence also useful as materials for elastic fibers.

Detailed Description Paragraph Table (3):

TABLE 3

<u>Polyurethane</u> pellets <u>Polyurethane</u> production conditions Retention MDI BD Feed Sn											
content .eta..sub.inh	Long-chain	ratio	R.R.	of Polyester	diol (mole	(mole	rate	(Sn-atom)	*1 HS content	when heat	.eta..sub.inh (mole ratio)
(ppm)	(dl/g)	(%)	melted (%)	(%)	*2						
Ex. 1 PMPA											
Comp. E (1)	(4.01)	(3)	300	0.61	1.08	70	95	90	2	PMPA	Comp. F (1)
1.05	70	94	92	3	PBA	Comp. C (1)	(4.2)	(3.2)	300	1.02	1.00
(4.72)	(3.7)	270	3.92	1.20	73	95	91	5	PMPA	Comp. H (1)	(3.8)
92	6	PMPA	Comp. I (1)	(3.52)	(2.5)	270	11.06	1.15	62	89	96
300	0	1.03	66	68	87	Ex. 1	2	PMPA-B (1)	(4.01)	(3)	200
(4.72)	(3.7)	270	0	0.99	64	70	87	4	PMPA-D (1)	(3.52)	(2.5)
Comp. J (1)	(3.52)	(2.5)	270	22.11	1.07	59	75	94			

Notes *1:

inherent viscosity; *2: retention ratio of inherent viscosity when melt treated.

Detailed Description Paragraph Table (5):

Art Unit: 1711

6. Claims 1-12 are rejected under 35 U.S.C. 102(b) as being anticipated by Dotzauer et al (CA2037214).

Disclosure of Dotzauer presented in brief earlier, shows that 1-12 lack novelty.

7. - Any inquiry concerning this communication or earlier communications from the examiner should be directed to U.K. Rajguru whose telephone number is 703-308-3224. The examiner can normally be reached on Monday-Friday from 9:30am to 6:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, James J. Seidleck, can be reached on (703) 703-308-2462. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9310/9311.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

UKRajguru:evh

8/26/02

TABLE 5

Production conditions for Elastic fiber polyurethane and elastic fiber Retention MDI BD
 Spinning Sn content .eta..sub.inh Long- ratio R.R. of Polyester diol (mole (mole speed
 (Sn-atom) *1 chain HS when heat .eta..sub.inh (mole ratio) ratio) ratio) (m/min) (ppm)
 (dl/g) content (%) melted (%) (%) *2

															Ex. 7 PMAZ	
Comp. C	(1)	(3.09)	(2)	500	2.78	1.25	63	94	93	8	PMAZ	Comp. C	(1)	(3.09)	(2)	800 2.78
1.23	63	94	92	9	PMAZ	Comp. D	(1)	(3.09)	(2)	500	1.29	1.28	64	95	89	10 PMPA
(3.09)	(2)	500	2.30	1.30	61	89	90	11	PMPA	Comp. L	(1)	(3.09)	(2)	500	1.15	1.21 61 90 88
Comp. PMAZ-A	(1)	(3.09)	(2)	500	0	1.15	54	64	89	Ex. 6	7 PMAZ-B	(1)	(3.09)	(2)	500	0
1.05	64	96	75	8	PMAZ-A	(1)	(3.09)	(2)	800	0	1.18	55	63	88	9 PMAZ-B	(1) (3.09) (2) 800 0
0.98	61	93	74	10	PMAZ	Comp. E	(1)	(3.09)	(2)	800	22.9	1.31	57	70	96	

Notes *1:
 inherent viscosity; *2: retention ratio of inherent viscosity when melt treated.

CLAIMS:

1. A process for producing thermoplastic polyurethane compositions, which comprises:
 - a) producing a polymeric diol by esterification polymerization with a titanium-containing esterification catalyst;
 - b) deactivating said titanium-containing esterification catalyst by the steps of:
 - (1) heating the polymeric diol containing the titanium-containing esterification catalyst at a temperature and in the presence of an amount of water effective to decrease the activity of said catalyst; or
 - (2) adding a phosphorus compound to the polymeric diol containing the titanium-containing esterification catalyst; and
 - c) conducting melt polymerization of said polymeric diol with an organic diisocyanate and a chain extender, in the presence of a tin compound.
8. The process of claim 7, wherein said tetraalkoxy titanium compounds are selected from the group consisting of tetraisopropyl titanate, tetra-n-butyl titanate, tetra-2-ethylhexyl titanate and tetrastearyl titanate.

Application/Control Number: 09/254,666

Art Unit: 1711

Page 2 (891)

*please return
these pages*

DETAILED ACTION



**UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
ASSISTANT SECRETARY AND COMMISSIONER OF
PATENTS AND TRADEMARKS
Washington, D.C. 20231**

**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Paper No. 12

Application Number: 09/254666

Filing Date: 03/15/1999

Appellant(s): Schaffer, H.

Glenn J. Perry
For Appellant

EXAMINER'S ANSWER

This is in response to appellant's brief on appeal filed 6/11/2001.

(1) *Real Party in Interest*

Set Name Query

side by side

Hit Count Set Name

result set

DB=USPT,JPAB,EPAB,DWPI,TDBD; PLUR=YES; OP=ADJ

<u>L1</u>	polyurethane or poly urethane	246124	<u>L1</u>
<u>L2</u>	(polyisocyanate or poly isocyanate or poly ICN) with titanium	279	<u>L2</u>
<u>L3</u>	titanium same (tetravalent or tetra valent or "+4" or tetra adj3 titanate)	3459	<u>L3</u>
<u>L4</u>	titanium same (tetravalent or tetra valent or "+4" or tetra adj3 titanate or valency near3 four or valent near3 four or valency near3 "4" or valent near3 "4")	3542	<u>L4</u>
<u>L5</u>	l1 and L4	244	<u>L5</u>
<u>L6</u>	(polyisocyanate or poly isocyanate or poly ICN) and l5	113	<u>L6</u>
<u>L7</u>	((528/44 528/45 528/48 528/49 528/50 528/51 528/52 528/53 528/54 528/55 528/56 528/57 528/58 528/59 528/60 528/61 528/62 528/63 528/64 528/65 528/66 528/67 528/68 528/69 528/70 528/71 528/72 528/73 528/74 528/74.5 528/75 528/76 528/77 528/78 528/79 528/80 528/81 528/82 528/83 528/84 528/85)!.CCLS.) and L6	23	<u>L7</u>
<u>L8</u>	(polyisocyanate or poly isocyanate or poly ICN) with (blocked or blocking or capped or capping)	6993	<u>L8</u>
<u>L9</u>	l7 and L8	1	<u>L9</u>

END OF SEARCH HISTORY

WEST[Generate Collection](#)[Print](#)**Search Results - Record(s) 1 through 1 of 1 returned.**☐ 1. Document ID: US 6525161 B1

L9: Entry 1 of 1

File: USPT

Feb 25, 2003

US-PAT-NO: 6525161

DOCUMENT-IDENTIFIER: US 6525161 B1

TITLE: Powder coating compositions and a method for coating a substrate

DATE-ISSUED: February 25, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Hall; Stephen Anthony	South Giamorgan			GB

US-CL-CURRENT: 528/49, 252/182.18, 427/375, 522/90, 526/301, 528/53, 528/55, 528/75,
560/115, 560/118, 560/158, 560/25

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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Term	Documents
(7 AND 8).USPT,JPAB,EPAB,DWPI,TDBD.	1
(L7 AND L8).USPT,JPAB,EPAB,DWPI,TDBD.	1

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DATE: Tuesday, April 15, 2003 [Printable Copy](#) [Create Case](#)

Set Name Query

side by side

Hit Count Set Name

result set

DB=USPT,JPAB,EPAB,DWPI,TDBD; PLUR=YES; OP=ADJ

<u>L1</u>	polyurethane or poly urethane	246124	<u>L1</u>
<u>L2</u>	(polyisocyanate or poly isocyanate or poly ICN) with titanium	279	<u>L2</u>
<u>L3</u>	titanium same (tetravalent or tetra valent or "+4" or tetra adj3 titanate)	3459	<u>L3</u>
<u>L4</u>	titanium same (tetravalent or tetra valent or "+4" or tetra adj3 titanate or valency near3 four or valent near3 four or valency near3 "4" or valent near3 "4")	3542	<u>L4</u>
<u>L5</u>	l1 and L4	244	<u>L5</u>
<u>L6</u>	(polyisocyanate or poly isocyanate or poly ICN) and l5	113	<u>L6</u>
<u>L7</u>	((528/44 528/45 528/48 528/49 528/50 528/51 528/52 528/53 528/54 528/55 528/56 528/57 528/58 528/59 528/60 528/61 528/62 528/63 528/64 528/65 528/66 528/67 528/68 528/69 528/70 528/71 528/72 528/73 528/74 528/74.5 528/75 528/76 528/77 528/78 528/79 528/80 528/81 528/82 528/83 528/84 528/85)!.CCLS.) and L6	23	<u>L7</u>

END OF SEARCH HISTORY

WEST[Generate Collection](#)[Print](#)**Search Results - Record(s) 1 through 10 of 23 returned.**☐ 1. Document ID: US 6525161 B1

L7: Entry 1 of 23

File: USPT

Feb 25, 2003

US-PAT-NO: 6525161

DOCUMENT-IDENTIFIER: US 6525161 B1

TITLE: Powder coating compositions and a method for coating a substrate

DATE-ISSUED: February 25, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Hall; Stephen Anthony	South Giamorgan			GB

US-CL-CURRENT: 528/49; 252/182.18, 427/375, 522/90, 526/301, 528/53, 528/55, 528/75, 560/115, 560/118, 560/158, 560/25

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	KWC	Draw Desc	Image
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☐ 2. Document ID: US 6291624 B1

L7: Entry 2 of 23

File: USPT

Sep 18, 2001

US-PAT-NO: 6291624

DOCUMENT-IDENTIFIER: US 6291624 B1

TITLE: Composition which is useful for obtaining a matt or satin coating, use of this composition and coating thus obtained

DATE-ISSUED: September 18, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Ardaud; Pierre	Sainte-Foy-les-Lyon			FR
Williams; Francis John	Llinars del Valles			ES
Bernard; Jean-Marie	Mornant			FR
Vogin; Bernard	Chaponost			FR

US-CL-CURRENT: 528/45; 525/440

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	KWC	Draw Desc	Image
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☐ 3. Document ID: US 6197915 B1

L7: Entry 3 of 23

File: USPT

Mar 6, 2001

US-PAT-NO: 6197915

DOCUMENT-IDENTIFIER: US 6197915 B1

TITLE: Thermoplastic polyurethanes, polyurethane elastic fibers therefrom, and method for producing the fibers

DATE-ISSUED: March 6, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Yamana; Yoshihiro	Okayama-ken			JP
Ono; Hiroyuki	Okayama-ken			JP

US-CL-CURRENT: 528/76; 264/176.1, 528/59, 528/61, 528/64, 528/80, 528/906

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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☐ 4. Document ID: US 5606005 A

L7: Entry 4 of 23

File: USPT

Feb 25, 1997

US-PAT-NO: 5606005

DOCUMENT-IDENTIFIER: US 5606005 A

TITLE: Polyurethane and molded article comprising the same

DATE-ISSUED: February 25, 1997

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Oshita; Tatuya	Kurashiki			JP
Nakayama; Kimio	Kurashiki			JP
Ishiguro; Michihiro	Kurashiki			JP
Hirai; Koji	Kurashiki			JP
Suzuki; Shigeaki	Kurashiki			JP
Yoshimura; Noriaki	Kurashiki			JP

US-CL-CURRENT: 528/83; 528/906

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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☐ 5. Document ID: US 4891421 A

L7: Entry 5 of 23

File: USPT

Jan 2, 1990

US-PAT-NO: 4891421

DOCUMENT-IDENTIFIER: US 4891421 A

** See imag for Certificate of Correction **

TITLE: Processes for producing polycarbonate polyols

DATE-ISSUED: January 2, 1990

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Nishimura; Katsuhide	Sakai			JP
Kunugiza; Motoyasu	Suita			JP
Shirota; Hiroharu	Izumi			JP
Ishizu; Hideyuki	Izumi			JP

US-CL-CURRENT: 528/370; 528/368, 528/481, 528/499, 528/500, 528/501, 528/85

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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KWC	Draw Desc	Image
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☐ 6. Document ID: US 4837245 A

L7: Entry 6 of 23

File: USPT

Jun 6, 1989

US-PAT-NO: 4837245

DOCUMENT-IDENTIFIER: US 4837245 A

TITLE: Process for the preparation of non-cellular or cellular polyurethane elastomers in the presence of a polyester polyol containing therein titanium and/or tin compounds as catalysts

DATE-ISSUED: June 6, 1989

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Streu; Joachim	Diepholz			DE
Straehle; Wolfgang	Heidelberg			DE
Ramlow; Gerhard	Weinheim			DE

US-CL-CURRENT: 521/117; 252/182.14, 252/182.3, 502/102, 502/151, 521/123, 521/127, 521/172, 521/173, 528/56, 528/58, 528/66

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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KWC	Draw Desc	Image
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☐ 7. Document ID: US 4732959 A

L7: Entry 7 of 23

File: USPT

Mar 22, 1988

US-PAT-NO: 4732959

DOCUMENT-IDENTIFIER: US 4732959 A

TITLE: Polyesterpolyol derivative and a poly(urethane)ureamide obtained therefrom

DATE-ISSUED: March 22, 1988

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Otani; Kozo	Amagasaki			JP
Yamada; Yoshio	Takatsuki			JP

US-CL-CURRENT: 528/68; 521/163, 525/418, 528/288, 528/331

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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KWC	Draw Desc	Image
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☐ 8. Document ID: US 4727094 A

L7: Entry 8 of 23

File: USPT

Feb 23, 1988

US-PAT-NO: 4727094

DOCUMENT-IDENTIFIER: US 4727094 A

TITLE: Method for producing polyurethanes

DATE-ISSUED: February 23, 1988

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Hoy; Kenneth L.	St. Albans	WV		
Taylor; Glenn A.	S. Charleston	WV		

US-CL-CURRENT: 521/164; 521/167, 521/172, 521/174, 528/76, 528/77, 528/78, 528/80,
528/81, 528/82

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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KWIC	Draw Desc	Image
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☐ 9. Document ID: US 4722946 A

L7: Entry 9 of 23

File: USPT

Feb 2, 1988

US-PAT-NO: 4722946

DOCUMENT-IDENTIFIER: US 4722946 A

TITLE: Energy-attenuating polyurethanes

DATE-ISSUED: February 2, 1988

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Hostettler; Fritz	Whitehall	PA		

US-CL-CURRENT: 521/158; 521/159, 521/161, 521/167, 521/172, 521/173, 521/175, 521/176,
528/59, 528/60, 528/65, 528/66, 528/80, 528/81, 528/83

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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KWIC	Draw Desc	Image
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☐ 10. Document ID: US 4652589 A

L7: Entry 10 of 23

File: USPT

Mar 24, 1987

US-PAT-NO: 4652589

DOCUMENT-IDENTIFIER: US 4652589 A

TITLE: Polymer/polyols having improved combustion resistance and intrinsic viscosity, methods of making same and polyurethanes prepared therefrom

DATE-ISSUED: March 24, 1987

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Simroth; Donald W.	Charleston	WV		
Critchfield; Frank E.	South Charleston	WV		
Myerly; Richard C.	Charleston	WV		

WEST[Generate Collection](#)[Print](#)**Search Results - Record(s) 11 through 20 of 23 returned.**☐ 11. Document ID: US 4649162 A

L7: Entry 11 of 23

File: USPT

Mar 10, 1987

US-PAT-NO: 4649162

DOCUMENT-IDENTIFIER: US 4649162 A

TITLE: Process for the preparation of cellular or noncellular plastics from at least two components which react with one another

DATE-ISSUED: March 10, 1987

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Roche; Peter	Munich			DE
Rank; Mathaeus	Olching/Neu-Esting			DE

US-CL-CURRENT: 521/78; 521/133, 521/82, 528/44, 528/48, 528/483, 528/59, 528/67, 528/76, 528/77[Full](#) [Title](#) [Citation](#) [Front](#) [Review](#) [Classification](#) [Date](#) [Reference](#) [Sequences](#) [Attachments](#)[KWC](#) [Draw Desc](#) [Image](#)☐ 12. Document ID: US 4622361 A

L7: Entry 12 of 23

File: USPT

Nov 11, 1986

US-PAT-NO: 4622361

DOCUMENT-IDENTIFIER: US 4622361 A

TITLE: Flame retarded high modulus polyurethane elastomers and method of making same

DATE-ISSUED: November 11, 1986

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Gill; William A.	Hurricane	WV		
Gerkin; Richard M.	Cross Lanes	WV		

US-CL-CURRENT: 524/710; 264/328.1, 264/328.6, 264/328.8, 524/712, 524/786, 524/789, 525/131, 525/455, 528/72, 528/74.5, 528/76, 528/77, 528/78, 528/79[Full](#) [Title](#) [Citation](#) [Front](#) [Review](#) [Classification](#) [Date](#) [Reference](#) [Sequences](#) [Attachments](#)[KWC](#) [Draw Desc](#) [Image](#)☐ 13. Document ID: US 4594366 A

L7: Entry 13 of 23

File: USPT

Jun 10, 1986

US-PAT-NO: 4594366

DOCUMENT-IDENTIFIER: US 4594366 A

TITLE: Connected branched polyols and polyurethanes based thereon

DATE-ISSUED: June 10, 1986

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Taylor; Glenn A.	South Charleston	WV		
Hoy; Kenneth L.	Saint Albans	WV		

US-CL-CURRENT: 521/137; 523/400, 524/198, 524/310, 524/377, 524/504, 524/565, 524/566,
524/567, 524/568, 524/569, 524/575, 524/728, 524/760, 524/762, 528/75

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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KWIC	Draw Desc	Image
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☐ 14. Document ID: US 4379862 A

L7: Entry 14 of 23

File: USPT

Apr 12, 1983

US-PAT-NO: 4379862

DOCUMENT-IDENTIFIER: US 4379862 A

TITLE: Process for the preparation of polyurethane resins using low molecular weight polyhydroxyl compounds prepared by the condensation of formaldehyde

DATE-ISSUED: April 12, 1983

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Wagner; Kuno	Leverkusen			DE

US-CL-CURRENT: 521/158; 521/170, 528/76, 528/80, 528/85

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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KWIC	Draw Desc	Image
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☐ 15. Document ID: US 4350780 A

L7: Entry 15 of 23

File: USPT

Sep 21, 1982

US-PAT-NO: 4350780

DOCUMENT-IDENTIFIER: US 4350780 A

TITLE: Polyurethanes made with polymer/polyols prepared via preformed stabilizers

DATE-ISSUED: September 21, 1982

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Van Cleve; Russell	Charleston	WV		
Armstrong; George H.	Charleston	WV		
Simroth; Donald W.	Charleston	WV		

US-CL-CURRENT: 521/137; 521/904, 521/914, 524/881, 528/75

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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KWIC	Draw Desc	Image
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☐ 16. Document ID: US 4332716 A

L7: Entry 16 of 23

File: USPT

Jun 1, 1982

US-PAT-NO: 4332716

DOCUMENT-IDENTIFIER: US 4332716 A

TITLE: Polymer/polyisocyanate compositions, processes for making same and processes for making polyurethane products therefrom

DATE-ISSUED: June 1, 1982

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Shah; Naresh R.	Nitro	WV		

US-CL-CURRENT: 521/137; 524/109, 524/195, 524/197, 524/377, 524/714, 524/752, 524/754, 524/762, 524/871, 524/873, 525/127, 525/129, 528/75

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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KWIC	Draw Desc	Image
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☐ 17. Document ID: US 4312973 A

L7: Entry 17 of 23

File: USPT

Jan 26, 1982

US-PAT-NO: 4312973

DOCUMENT-IDENTIFIER: US 4312973 A

TITLE: Polyurethane elastomers prepared from polyol or polymer/polyol-chain extender mixtures

DATE-ISSUED: January 26, 1982

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Critchfield; Frank E.	South Charleston	WV		
Gerkin; Richard M.	Charleston	WV		
Hawker; Leslie E.	South Charleston	WV		

US-CL-CURRENT: 528/75; 528/76, 528/77

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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KWIC	Draw Desc	Image
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☐ 18. Document ID: US 4283500 A

L7: Entry 18 of 23

File: USPT

Aug 11, 1981

US-PAT-NO: 4283500

DOCUMENT-IDENTIFIER: US 4283500 A

** See image for Certificate of Correction **

TITLE: Polymer/polyisocyanates

DATE-ISSUED: August 11, 1981

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Armstrong; George H.	Charleston	WV		
Gerkin; Richard M.	Charleston	WV		
Critchfield; Frank E.	South Charleston	WV		

US-CL-CURRENT: 521/137; 525/123, 525/127, 525/129, 525/455, 526/341, 526/342, 528/75

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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KWIC	Draw Desc	Image
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☐ 19. Document ID: US 4263411 A

L7: Entry 19 of 23

File: USPT

Apr 21, 1981

US-PAT-NO: 4263411

DOCUMENT-IDENTIFIER: US 4263411 A

TITLE: Polyurethane compositions and process for preparing polyurethane emitting reduced amounts of toxic fumes on burning using a cobalt, copper, nickel or manganese salt

DATE-ISSUED: April 21, 1981

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Bak; Eugene	Polk	PA		

US-CL-CURRENT: 521/108; 521/123, 521/124, 521/125, 521/129, 528/51, 528/53, 528/55, 528/56, 528/57

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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KWIC	Draw Desc	Image
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☐ 20. Document ID: US 4242249 A

L7: Entry 20 of 23

File: USPT

Dec 30, 1980

US-PAT-NO: 4242249

DOCUMENT-IDENTIFIER: US 4242249 A

** See image for Certificate of Correction **

TITLE: Polymer/polyols via non-aqueous dispersion stabilizers

DATE-ISSUED: December 30, 1980

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Van Cleve; Russell	Charleston	WV		
Armstrong; George H.	Charleston	WV		
Simroth; Donald W.	Charleston	WV		

US-CL-CURRENT: 524/769; 252/384, 516/17, 516/18, 516/67, 516/76, 516/DIG.6, 516/DIG.7, 521/137, 528/75

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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528/44.EPAB,JPAB,USPT.	1306
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528/48.EPAB,JPAB,USPT.	844
528/49.EPAB,JPAB,USPT.	919
528/50.EPAB,JPAB,USPT.	95
528/51.EPAB,JPAB,USPT.	340
528/52.EPAB,JPAB,USPT.	644
528/53.EPAB,JPAB,USPT.	790
528/54.EPAB,JPAB,USPT.	263
528/55.EPAB,JPAB,USPT.	471
528/56.EPAB,JPAB,USPT.	273
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L7: Entry 21 of 23

File: USPT

Aug 26, 1980

US-PAT-NO: 4219508

DOCUMENT-IDENTIFIER: US 4219508 A

TITLE: Process for the preparation of low molecular weight polyhydroxyl compounds

DATE-ISSUED: August 26, 1980

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Wagner; Kuno	Leverkusen			DE

US-CL-CURRENT: 568/387; 252/364, 252/73, 435/243, 435/247, 516/DIG.1, 516/DIG.2,
521/107, 521/116, 521/158, 521/164, 521/168, 528/85, 549/417, 549/450, 549/453,
549/488, 554/223, 560/198, 560/263, 562/553, 562/561, 564/473, 568/388, 568/463,
568/496, 568/679, 568/723, 568/833, 568/852, 568/863

[Full](#) [Title](#) [Citation](#) [Front](#) [Review](#) [Classification](#) [Date](#) [Reference](#) [Sequences](#) [Attachments](#)[KVMC](#) [Draw Desc](#) [Image](#)☐ **22. Document ID: US 4172825 A**

L7: Entry 22 of 23

File: USPT

Oct 30, 1979

US-PAT-NO: 4172825

DOCUMENT-IDENTIFIER: US 4172825 A

TITLE: Polymer/polyols and process for production thereof

DATE-ISSUED: October 30, 1979

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Shook; Edgar G.	South Charleston	WV		
Simroth; Donald W.	Charleston	WV		
VAN Cleve; Russell	Charleston	WV		
Steinle, Jr.; Edmund C.	South Charleston	WV		

US-CL-CURRENT: 524/377; 521/137, 528/75[Full](#) [Title](#) [Citation](#) [Front](#) [Review](#) [Classification](#) [Date](#) [Reference](#) [Sequences](#) [Attachments](#)[KVMC](#) [Draw Desc](#) [Image](#)☐ **23. Document ID: US 4071492 A**

L7: Entry 23 of 23

File: USPT

Jan 31, 1978

US-PAT-NO: 4071492
DOCUMENT-IDENTIFIER: US 4071492 A

TITLE: Polyurethane-urea elastomers based on propylene oxide-tetrahydrofuran copolymers

DATE-ISSUED: January 31, 1978

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Bethea; Tristram Walker	Fairlawn	OH		
Futamura; Shingo	Seville	OH		

US-CL-CURRENT: 524/775; 528/64, 528/76

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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528/55.EPAB,JPAB,USPT.	471
528/56.EPAB,JPAB,USPT.	273
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